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257
305

Oil fuel

Heater

Regenerator

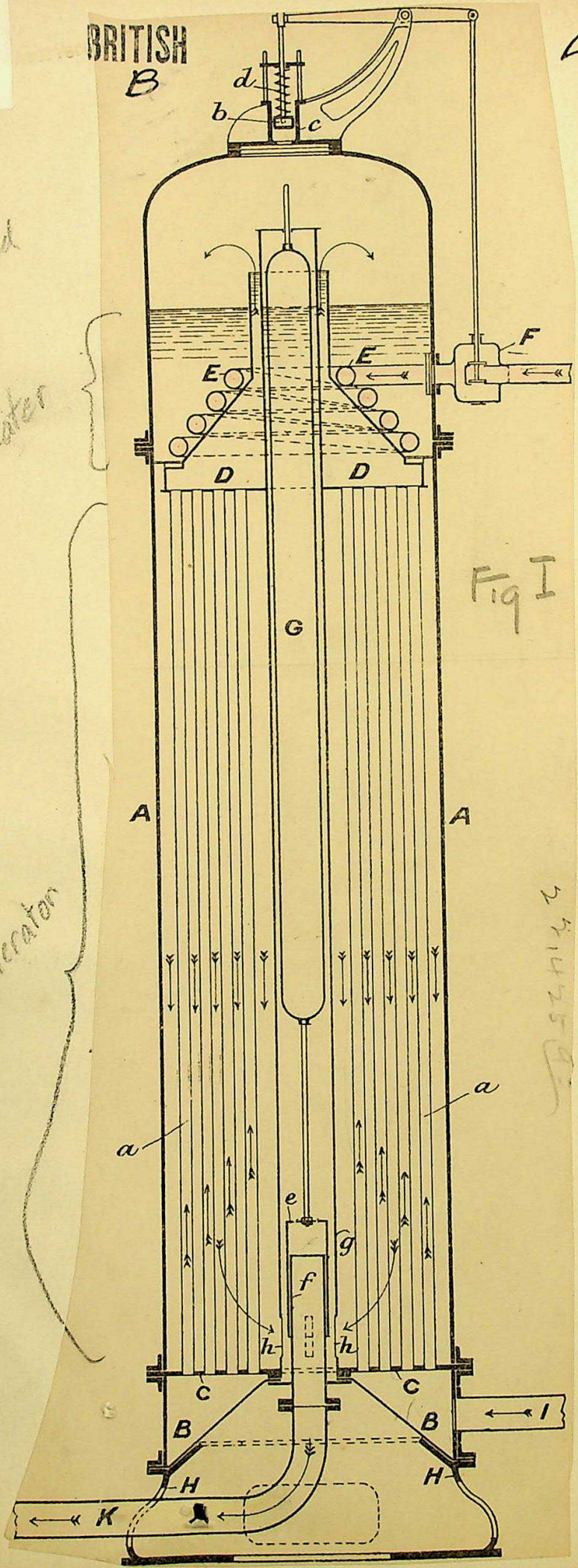
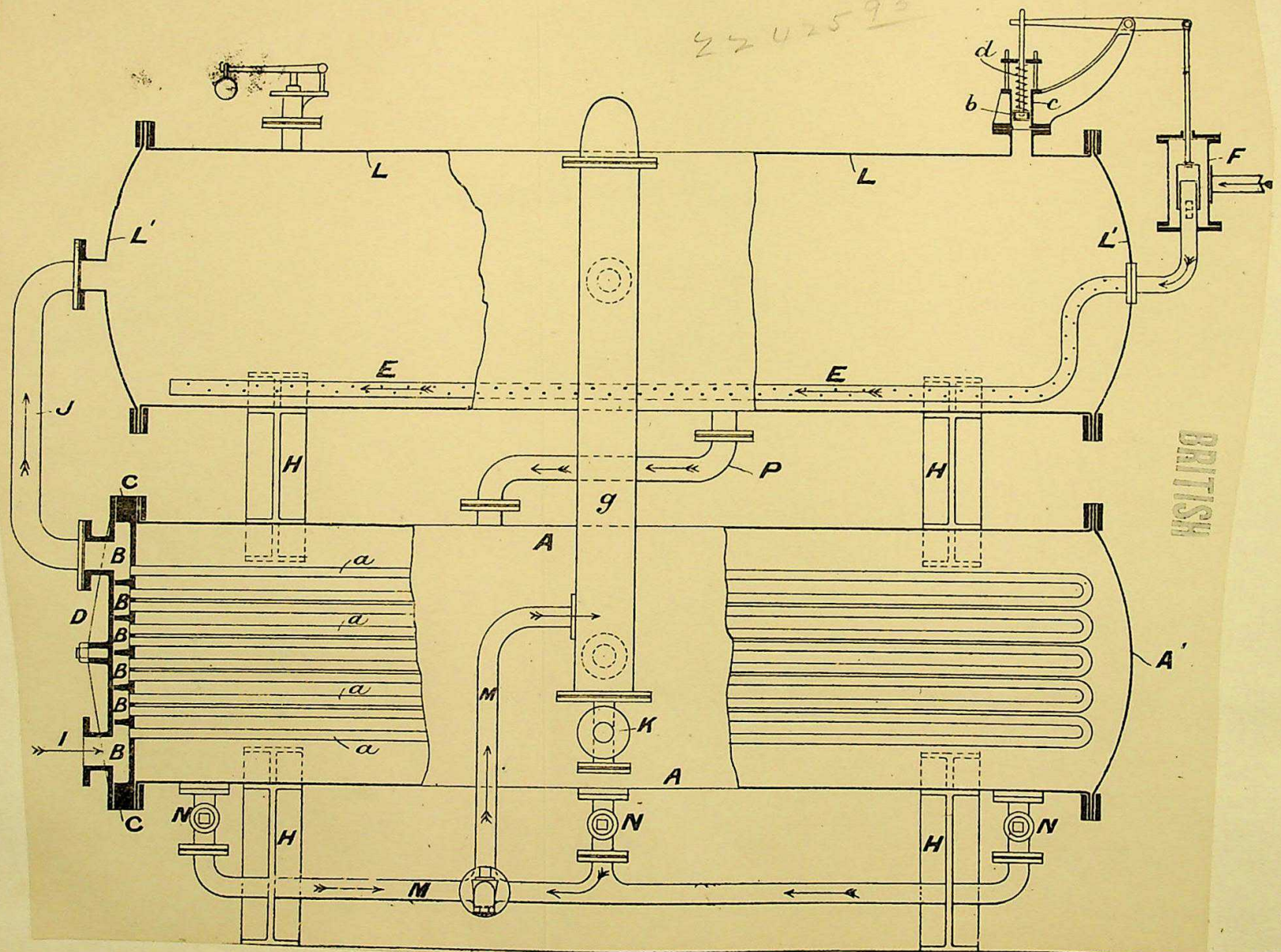


Fig I

FIG. 2.



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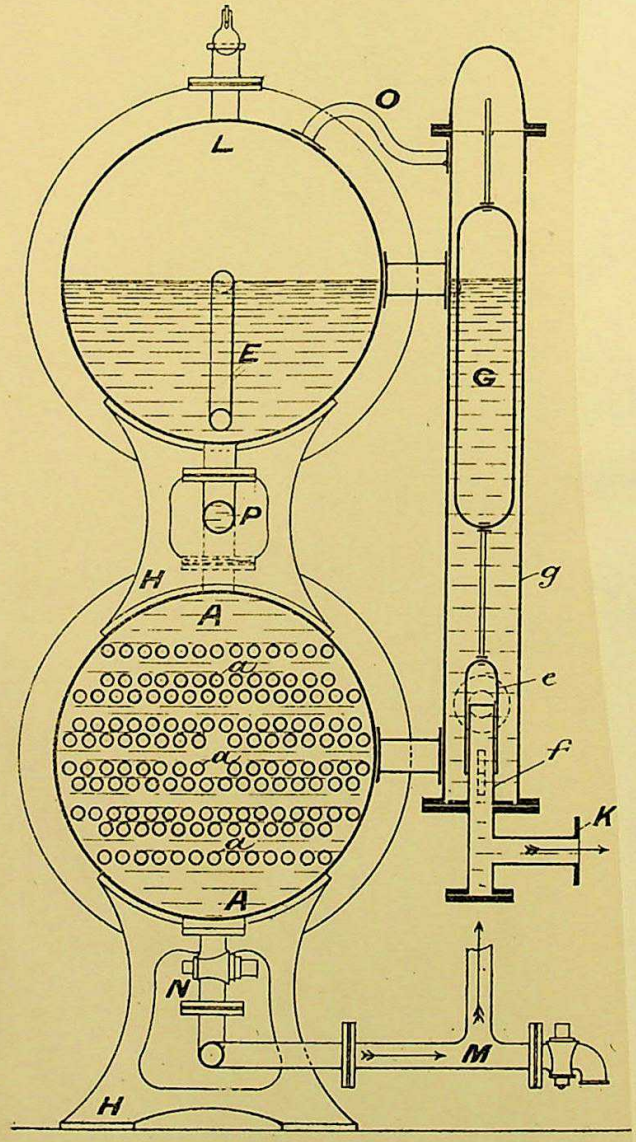
SQUIRE'S COMPLETE SPECIFICATION.

FIG. 3.



BRITISH

N° 22,425 A.D. 1893

Date of Application, 23rd Nov., 1893
Complete Specification Left, 23rd Aug., 1894—Accepted, 17th Nov., 1894

PROVISIONAL SPECIFICATION

Apparatus for Heating Liquids under Pressure.

I LIONEL ROBERT LITTLER SQUIRE of Clarendon House, St. John's Wood Park, London N.W. Mechanical Engineer do hereby declare the nature of this invention to be as follows :—

This invention relates to apparatus so constructed that liquids may be heated to a desired temperature under pressure with a small expenditure of fuel, the flow of the liquid, and the supply of steam being regulated automatically.

In order to accomplish this, I construct a tall cylindrical vessel which may be of iron or copper according to circumstances. This vessel is furnished with a false bottom in which a number of small thin tubes are fixed, which unite in a chamber open at the top near the top of the apparatus. The liquid to be treated is pumped in between the bottom of the apparatus, and the false bottom, and rising through the tubes passes into the above named chamber, and overflows into the space outside the tubes. In this outside space the liquid is kept at a constant level by means of a float which governs an outlet valve at the bottom of the outside space. The upper portion of the column of liquid thus formed is traversed by a steam coil which may, or may not, be perforated. The admission of steam is controlled by a balanced valve, which is operated by a piston working against a spring in a cylinder at the top of the apparatus, so that as the pressure in the apparatus increases the balanced valve is gradually closed.

The action of the apparatus is as follows ;—The liquid pumped in beneath the false bottom rises in the tubes and is heated by the hot liquid descending in the outside space. It then overflows from the chamber at the top of the tubes into the upper part of the outside space which is the zone of highest temperature. It is here raised to the required temperature by the steam coil, and gradually descending in the outside space gives up its heat to the incoming liquid in the tubes, and finally leaves the apparatus by the valve operated by the float at a temperature not much above that at which it entered the apparatus. The pressure, and consequently the temperature to which it has been heated remaining constant as a result of the piston and balanced valve device.

Dated this 22nd day of November 1893.

LIONEL R. L. SQUIRE.

COMPLETE SPECIFICATION.

Apparatus for Heating Liquids under Pressure.

I LIONEL ROBERT LITTLER SQUIRE of Clarendon House, St. John's Wood Park, London, N.W. Mechanical Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to apparatus so constructed that liquids may be heated to a desired temperature under pressure with a small expenditure of fuel, the flow of the liquid and the supply of steam being regulated automatically.

In the accompanying drawings, Fig. 1 represents one form of the apparatus shewn in section.

A A is a vertical cylinder closed at the top, and separated from a bottom chamber B B by a perforated plate C C. Into the perforations of this plate are

expanded or soldered, small tubes *a a*, preferably of copper, which at their upper extremity terminate in a chamber of conical form D D open at the top, a space being left round this chamber between it and the external cylinder.

Around the outside of the conical portion of the chamber a steam coil E. E. is fixed, which may either be closed at the end, and perforated with small holes, or it may be not perforated in which case it must be brought out through the wall of the external cylinder, and provided with a steam trap, (not shown in the drawing).

The steam is admitted to this coil by means of a balance valve F which is operated by the movements of a piston *b* moving in a cylinder *c*, and controlled by a spring *d* acting on its upper side. In the centre of the apparatus there is a float G which raises or lowers a cylindrical sleeve *e* perforated at the top, which opens more or less the slits on the small closed cylinder *f*, and so allows the liquid to escape with more or less rapidity according to the position of the float. This sleeve valve may be replaced, but less conveniently by a balanced valve of the ordinary construction.

The float G is surrounded by a thin tube *g* soldered into the bottom of the conical chamber D D and passing completely through and somewhat above the chamber. This tube separates the float from the conical chamber but there are slits *h h*, cut in the bottom of the tube so as to allow the liquid outside the small tubes *a a* to pass to the sleeve valve, which is regulated by the float. H. H. represents a cast iron base upon which the apparatus rests.

The action of the apparatus is as follows;—The liquid to be treated is pumped in through the pipe I into the chamber B B from which it rises through the tubes *a a* into the conical chamber D D. From this it overflows into the space at the upper part of the cylinder A A where it encounters the action of the steam. The liquid then gradually descends in the space outside the tubes *a a* giving up its heat to the incoming liquid in the tubes and finally passes out through the slits *h h* in the tube *g*, and the slits in the sleeve valve *f*, and out of the apparatus through the pipe K.

In this way the liquid reaches the upper part of the apparatus heated already to a high temperature, while the liquid which has been treated leaves the apparatus at a temperature not much above that of the incoming liquid.

The regulation of the quantity of liquid at any time in the apparatus is effected by the action of the float G, which rises and opens the outlet valve when there is too much liquid in the apparatus, but falls and shuts the outlet valve when the level of the liquid falls too low. The regulation of the steam and of the pressure, and consequently of the temperature, to which the liquid is to be heated in the upper part of the apparatus is effected by the movements of the piston *b* in the cylinder *c*. When the temperature and consequently the pressure becomes too great the piston rises compressing the spring *d* against which it acts, and at the same time closes more or less the balance valve F. If, on the contrary, the temperature and consequently the pressure falls, the spring *d* forces down the piston *b* and at the same time opens the balanced valve F and admits more steam. The apparatus is consequently automatic.

Fig. 2 represents another form of the apparatus shown in longitudinal section, and Fig. 3 a transverse section of the same.

A A is a horizontal cylinder closed at one end by a cover A^1 and at the other end by a perforated plate C C which is furnished with a thick rim, and transverse ribs of the same height as the rim between each pair of perforations.

In the perforations of this plate are expanded or soldered U shaped tubes *a a* of nearly the same length as the cylinder. A cover D is bolted to the rim of the perforated plate, so that it and the ribs of the perforated plate form chambers B B into which one set of tubes discharge, and from which the next set of tubes lead into the adjacent chamber, so that any liquid pumped into the lower chamber is forced to traverse the entire length of the tubes before reaching the top chamber.

From the top chamber a pipe J leads to another cylinder L L placed above the

first, which is closed by the two covers L^1 L^1. This cylinder, in which the heating is accomplished, is furnished with a steam pipe E E which, as in the case of Fig. 1 may be either perforated or not. The steam pipe is furnished with the same device for regulating the steam as shown in Fig. 1., *viz.*, a balance valve, or as is shown in this case, a sleeve valve F controlled by a piston *b* and a spring *d*.

In this form of the apparatus the tube *g* containing the float G is placed at the side of the apparatus and communicates with it through the pipe M, which by means of the 3 cocks N N N may be made to draw off from either end or from the middle of the lower cylinder. A small pipe O establishes a communication between the upper cylinder L L and the upper part of the tube *g* containing the float. The action of the apparatus is as follows ;—

The liquid to be heated is pumped in at the inlet I. It then traverses the tubes *a a* and passes out by the pipe J into the upper cylinder L L where it is subjected to the action of steam. From this cylinder it descends by the pipe P into the lower cylinder in the space outside the pipes, giving up its heat to the incoming liquid in the pipes *a a*, and then passes through the pipe M to the sleeve valve *e* controlled by the float G which regulates the rate of discharge. The action of the float in regulating the discharge, and that of the piston and spring in regulating the steam is the same as that already described in Fig. 1.

Having now particularly described and ascertained the nature of this invention, and in what manner the same is to be performed I declare that what I claim is ;—

1. Maintaining a constant temperature of the boiling liquid to be treated by means of a piston acting against a spring controlling the balanced or sleeve valve which regulates the admission of the steam substantially as described.

2. The combination of the tube arrangement by which the heat of the outgoing [illegible] incoming liquid, with the balanced valve and spring [illegible] the float and valve arrangement by which the quantity of liquid in the apparatus is maintained at a constant level so as together to form an apparatus suitable for the purpose indicated, substantially as described.

Dated this 22nd day of August 1894.

W. S. SQUIR[illegible]
Agent for the Applica[illegible]

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